

WHAT IS CLAIMED IS:

1. An exposure apparatus comprising:
 - a projection optical system having a
5 predetermined image forming characteristic;
 - a mask stage, arranged on one side of said
projection optical system, for holding a mask substrate
and having a reference plate;
 - a wafer stage, arranged on the other side of said
10 projection optical system, for holding a wafer and
having a reference mark;
 - an optical modulation member for influencing an
image forming relation between the mask substrate and
the wafer, when the pattern on the mask substrate is
15 transferred to the wafer through said projection
optical system; and
 - an adjusting unit for substantially matching an
image forming relation between the reference plate and
the reference mark to the image forming relation
20 between the mask substrate and the wafer, which has
been influenced by said optical modulation member, when
positions of the reference plate and the reference mark
are detected through an optical path of said projection
optical system for positioning the mask substrate and
25 the wafer.
2. The exposure apparatus according to claim 1,

wherein said optical modulation member is configured with a pellicle for protecting the mask substrate, and an optical device for correcting an aberration of said projection optical system, and

5 said adjusting unit is a correction optical device arranged between the reference plate and said projection optical system for apparatus calibration or wafer positioning,

 wherein said correction optical device has an
10 equal thickness to a total thickness of the pellicle and the optical device which constitute said optical modulation member.

3. The exposure apparatus according to claim 2,
15 wherein in said optical modulation member, a combination of the pellicle and the optical device is determined so that the total thickness of the pellicle and the optical device is constant.

20 4. The exposure apparatus according to claim 2, wherein said correction optical device is formed into a partially processed shape or an aspherical shape so as to correct the aberration at the pupil position of said projection optical system.

25 5. The exposure apparatus according to claim 1, wherein said adjusting unit is realized by providing a

predetermined difference between a pattern surface position of the mask substrate that faces said projection optical system and a surface position of the reference plate that faces said projection optical system, in an optical axis direction of said projection optical system.

6. The exposure apparatus according to claim 5, wherein said optical modulation member is configured with at least one of a pellicle for protecting the mask substrate, and an optical device for correcting an aberration of said projection optical system,

wherein the predetermined difference T_{sp} is expressed by

$$T_{sp} = T_p \times (1 - 1/N_p) + T_g \times (1 - 1/N_g)$$

where T_p represents a thickness of the pellicle, N_p represents a refractive index, T_g represents a thickness of the optical device, and N_g represents a refractive index.

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7. The exposure apparatus according to claim 1, wherein said adjusting unit is realized by providing a predetermined difference between a wafer surface position that faces said projection optical system and a surface position of the reference mark that faces said projection optical system, in an optical axis direction of said projection optical system.

8. The exposure apparatus according to claim 7,
wherein the predetermined difference is provided by
driving the wafer stage in the optical axis direction
5 when apparatus calibration is performed.

9. The exposure apparatus according to claim 8,
wherein said optical modulation member is configured
with at least one of a pellicle for protecting the mask
10 substrate, and an optical device for correcting an
aberration of said projection optical system,

wherein the predetermined difference T_{wp} is
expressed by

$$T_{wp} = T_p \times (1 - 1/N_p) / \beta^2 + T_g \times (1 - 1/N_g) / \beta^2$$

15 where T_p represents a thickness of the pellicle, N_p
represents a refractive index, T_g represents a
thickness of the optical device, N_g represents a
refractive index, and β represents an image forming
magnification of said projection optical system.

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10. The exposure apparatus according to claim 1,
wherein said exposure apparatus is a scanning
projection exposure apparatus.

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